

REMARKS

Applicant respectfully requests reconsideration and allowance of the subject application. Claim 1, 13, 20, and 22 have been canceled. Claims 2-12, 14-19, 21, and 23-24 are pending, of which claim 2, 3, and 12 have been amended.

ALLOWABLE SUBJECT MATTER

Claims 16, 18, and 22 (which has been canceled) are indicated as being allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim. Applicant appreciates the indication of allowability.

OBJECTIONS TO THE SPECIFICATION

The Examiner has objected to the disclosure because the description of Fig.1 in the "Brief Description of the Drawings" did not identify Fig. 1 as "Prior Art." Appropriate correction has been made.

Additionally, two typographical errors to the specification have been corrected.

OBJECTIONS TO THE DRAWINGS

The Examiner has objected to the drawings as failing to comply with 37 C.F.R. 1.83(a). Specifically, the Examiner objects to claim 20 because the illustrated embodiment in Figure 5 shows the terminating elements as PIN diodes. The Examiner objects to claim 22 because the paddle is not shown in Figure 6, as Figure 6 is a top view and the paddle resides on the bottom of the device. In order to render these objections moot, Applicant has canceled claim 20 and claim 22.

CLAIM OBJECTIONS

Claim 15 has been objected to because of a typographical error. As suggested by the Examiner, the word "is" has been deleted.

35 U.S.C. §102 CLAIM REJECTIONS

The Examiner has rejected claims 12, 15, 17, and 21 under 35 U.S.C. §102 as being anticipated by U.S. Patent No. 5,463,355 to Halloran (hereinafter "Halloran"). Claim 12 has been amended to include the elements previously contained in claim 13, which has been deleted. The Examiner has conceded that these elements are not anticipated by Halloran. Thus, claim 12 as amended is no longer anticipated by Halloran. Claims 15, 17, and 21 depend from claim 12 and, as such, also are not anticipated by Halloran.

35 U.S.C. §103 CLAIM REJECTIONS

The Examiner has rejected independent claims 2 as being unpatentable over U.S. Patent No. 3,988,705 to Drapac (hereinafter "Drapac") in view of U.S. Patent No. 3,988,705 to Caragliano et al. (hereinafter "Caragliano").

The Examiner has rejected claim 13 (whose elements are now contained in independent claim 12) as being unpatentable over Halloran in further view of Caragliano.

All remaining pending claims depend from claim 2 or claim 12.

The Claimed Invention

The claimed invention as set forth in claim 12 provides an improved vector modulator circuit incorporating a novel quadrature hybrid. The quadrature hybrid taught in the claimed invention provides signal coupling and phase shifting without the need for discrete inductors and capacitors. The claimed invention accomplishes this feat by using a first spiral inductor and a second spiral inductor parasitically coupled across a dielectric layer to create intrinsic capacitance and thus eliminate the need for discrete capacitors in the quadrature hybrid. The small size and design parameters of the quadrature hybrid allow the complete vector modulator circuit including to be formed on a monolithic microwave integrated circuit (MMIC).

Drapac

Drapac teaches a circuit combining a 3db, 90 coupler, four-way power divider and a fourth coupler in order to create a four way divided output. The connection of these

components is disclosed along with the result created from such connection, but Drapac does not disclose the components of which each coupler is comprised..

Halloran

Halloran discloses a wideband vector modulator that sums the outputs of a plurality of quadrature phase shift key (QPSK) elements. Halloran does not teach the construction of couplers used in the modulator.

Caragliano

Caragliano discloses building a strip line directional coupler using an input line wound in a spiral and an output line wound in a spiral. These spirals are sandwiched between two distinct ground planes with dielectric material residing between the ground plan and the spiral with respect to both spirals, as well between the two spirals themselves. The spiral configuration used in Caragliano allowed for the space between the two ground planes to be reduced (see col. 2, lines 20-28).

The Examiner has not set forth a prima facie case of obviousness

As set forth in the MPEP:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skilled in the art, to modify the reference or to combined reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. MPEP 2143

The combination of references made by the Examiner fails to teach or suggest all of the claim limitations as set forth in Applicants claims.

Specific claim rejections

Claim 2

The Examiner has rejected claim 1 and 2 as unpatentable over Drapac in view of Caragliano. Claim 1 has been canceled, and the elements of claims 1 have been added to claim 2. With respect to amended claim 2, Applicant traverses the rejection.

A combination of Drapac and Caragliano fails to teach all of the elements of Applicants' invention as claimed in claim 2.

Claim 2 recites:

2. A circuit functioning as a quadrature hybrid comprising;
a first spiral inductor and a second spiral inductor;
said circuit further comprising an insulating layer disposed between said first spiral inductor and said second spiral inductor, *wherein said first spiral inductor and said second spiral inductor and said insulating layer are positioned relative to each other to create an intrinsic capacitance.*

The Examiner states that Drapac shows the quadrature hybrid, but does not show a specific coupler. The Examiner further states that Caragliano shows a well-known art recognized spiral coupler having a plurality of inductors and a plurality of capacitances, where all capacitances are intrinsic. The structure of the hybrid claimed in claim 2 is not shown in Caragliano.

Caragliano teaches a strip line coupler formed by a pair of transmission lines in a spiral configuration on a printed circuit board. The two transmission lines are positioned between two ground planes, creating a balanced circuit construction. The desired circuit characteristics of the circuit in Caragliano are created as a function of the distance between the two ground planes, between each ground planes and each spiral, and between the two spirals (see col. 4, lines 63-68). Without the combination of two spirals and two ground planes, the circuit in Caragliano cannot operate.

The claimed invention does not require a pair of ground planes (i.e., the present invention can operate in an unbalanced construction). The required capacitance is created by the positioning of the spiral inductors relative to each other. Because the capacitance calculations are not dependent upon a pair of ground planes, the quadrature hybrid of the claimed invention can be formed on a MMIC having only a single ground (the chip paddle). A second ground plane is not necessary. This structure is not taught in Caragliano. While a mutual capacitance (C_m) between the spirals exists in Caragliano, C_m is a function of several items, including spacing between each line and its respective ground plane (Y) (see col. 4, line 62). (C_m) is not created by the positioning of the spirals relative to each other, but rather from a combination of the spiral positioning relative to each other and the two ground planes.

As a result of not requiring two ground planes, Applicants' invention can be formed in a smaller configuration than the circuit shown in Caragliano, which further increases suitability for construction on a MMIC chip.

Because the combination of Drapac and Caragliano fails to teach all of the elements of claim 2, this claim (and all those depending therefrom) should be in condition for allowance.

Claim 12

Claim 13 has been canceled, and the elements of claim 12 have been added to claim 12. The Examiner has rejected claim 13 (now included in amended claim 12) as unpatentable over Halloran in view of Caragliano. With respect to amended claim 12, Applicant traverses the rejection.

Claim 12 (as amended) recites:

A circuit for performing vector modulation, said circuit encapsulated within a chip scale package, comprising:

an MMIC, said MMIC comprising:

two quadrature hybrids, wherein said hybrids comprise:

a first spiral inductor and a second spiral inductor;

an insulating layer disposed between said first spiral inductor and said

second spiral inductor, *wherein said first spiral inductor and said second spiral inductor and said insulating layer are positioned relative to each other to create an intrinsic capacitance*; and

a plurality of terminating elements.

Halloran teaches a prior art vector modulator that sums outputs of a plurality of QPSK modulator elements. Halloran does not teach using hybrids comprising the elements as claimed in claim 12. Specifically, Halloran does not teach hybrids comprising a first spiral inductor and a second spiral inductor; an insulating layer disposed between said first spiral inductor and said second spiral inductor, wherein said first spiral inductor and said second spiral inductor and said insulating layer are positioned relative to each other to create an intrinsic capacitance.

Caragliano also fails to teach these elements. As discussed with respect to claim 2, Caragliano fails to teach creating a desired capacitance using the positioning of the spirals positioned relative to each other (see discussion of claim 2, *supra*).

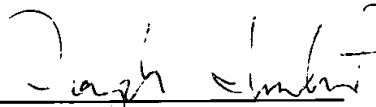
Because the combination of Halloran and Caragliano fails to teach all of the elements of claim 12, this claim (and all those depending therefrom) should be in condition for allowance.

CONCLUSION

Independent claims 2 and 12 are currently in condition for allowance. All remaining pending claims depend from either claim 2 or claim 12. Thus, pending claims 2-12, 14-19, 21, and 23-24 are currently in condition for allowance. Applicant respectfully requests reconsideration and issuance of the subject application. If any issues remain that preclude issuance of this application, the Examiner is urged to contact the undersigned attorney.

Respectfully Submitted,

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Date



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